United States Patent [19]

Lowitz

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[54] **APPARATUS AND METHOD FOR MEASURING TWO PROPERTIES OF AN OBJECT USING SCATTERED ELECTROMAGNETIC RADIATION**

[75] Inventor: **David A. Lowitz**, Richmond, Va.

[73] Assignee: **Philip Morris Incorporated**, New York, N.Y.

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[52] **U.S. Cl.** **324/631**; 324/638; 324/632; 324/643; 324/634; 131/905

[58] **Field of Search** 131/905, 906, 908; 324/631, 638, 632, 643, 634

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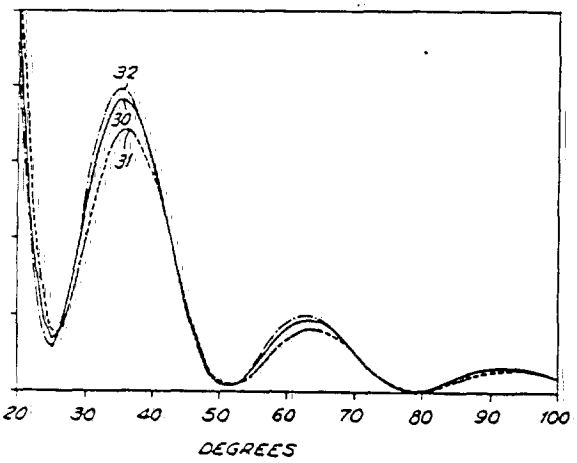
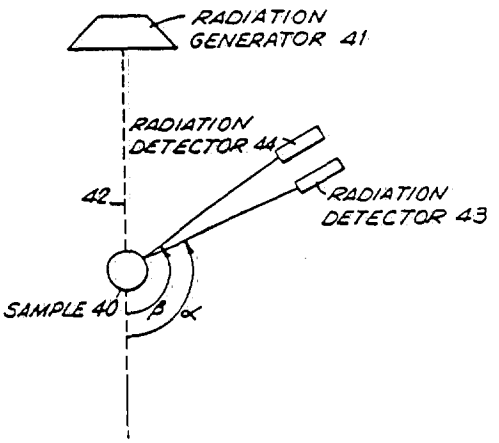
Primary Examiner—Reinhard J. Eisenzopf
Assistant Examiner—Jose M. Solis
Attorney, Agent, or Firm—Jeffrey H. Ingerman

[57] **ABSTRACT**

A method and apparatus for monitoring two components of an object, such as moisture content and density in a tobacco rod, using scattered electromagnetic radiation are provided. The invention relies on the fact that both the real imaginary parts of the dielectric constant of water vary greatly over frequencies in the gigahertz region while those of the remaining constitutents of tobacco do not, and particularly on the fact that, at frequencies approaching 100 GHz, the real part of the dielectric constant of water is much closer to that of many organic polymers, such as those making up tobacco, than it is at lower frequencies, and the imaginary part of the dielectric constant of water is much lower at frequencies approaching 100 GHz than it is in the region of 20 to 30 GHz. By comparing the scattering of electromagnetic radiation by the object—i.e., the cigarette rod—at two different frequencies and using a predetermined calibration curve based on a cigarette rod having a desired moisture content and density, one can determine the moisutre content and density of the cigarette rod. If the monitoring is taking place on a cigarette making machine and the moisture content and density deviate from their desired values, the machine feeds can be adjusted automatically to restore the desired moisture content and density.

35 Claims, 6 Drawing Sheets





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